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SPRUCE BUDWORM DAMAGE IN SPRUCE PLANTATIONS ON THE NICOLET NATIONAL FOREST, 1978

by

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INTRODUCTION

The eastern spruce budworm (Choristoneura fumiferana (Clemens)) has periodically caused defoliation of spruce and fir in the Nicolet National Forest, Wisconsin. The current outbreak on the Eagle River Ranger District, first report in 1972, caused defoliation on 300 acres[1/]. Erickson (1973) mapped 600 acres of moderate to heavy defoliation by spruce budworm in 1973. In 1974 the infestation had increased from 600 to 10,000 acres (Fowler and Hanson 1974), and Anderson (1975) reported 43,600 acres of light to heavy defoliation in 1975.

A growing concern for spruce budworm damage in high-value white spruce plantations prompted a request by Nicolet National Forest personnel for an evaluation. In November 1978, surveys of spruce budworm egg masses and defoliation were conducted.

1/ Banash, Stan. 1979. Personal conversation. Minnesota Department of Natural Resources, St. Paul, MN.

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SURVEY METHODS

Seven areas were designated for sampling and evaluation. Six plantations of white spruce, Picea glauca (Moench.) Voss and one plantation of Norway spruce, Picea abies, (L) Karst were sampled on the Eagle River Ranger District. Defoliation and egg-mass surveys were conducted in each area (see map).

The sampling unit used to estimate defoliation and egg-mass numbers consisted of a cluster of three trees. Clusters were chosen to adequately represent all portions of the plantation; the number selected was dependent upon plantation acreage and variability of tree age within the stand. Each cluster consisted of three full-crowned, partially defoliated, dominant or codominant spruce trees, in close proximity to each other. Clusters were a minimum of 5 chains apart.

Four 18-in. branches per tree were pruned from the midcrown, and subjective estimates of defoliation were made on 1978 foliage. In the laboratory two of the four branches collected from each tree were examined for egg masses with the use of a magnifying glass. Parasitized egg masses were recorded, but were not included in cluster egg-mass counts.

Cluster averages were calculated for each plantation. In addition, basal area, number of trees per acre, diameter at breast height (dbh), and crown condition were estimated for each area (Table 1).

RESULTS

Spruce budworm defoliation in each plantation ranged from light to heavy, but the majority of plantations suffered heavy defoliation (Table 2). Egg-mass counts indicate that most of the plantations will also suffer heavy defoliation in 1979 (Table 3).

An unusual defoliation pattern was evident in most of the plantations: the smaller understory trees were heavily defoliated, whereas the overstory trees had light to moderate defoliation. Also, damage had occurred on the mid-to-lower portion of trees rather than in the upper crowns, where it usually occurs.

DISCUSSION

Infestations in pure stands of white spruce have persisted for several years without causing appreciable mortality. White spruce suffers less damage than balsam fir because white spruce shoots grow significantly longer and more rapidly than balsam fir shoots, providing more food per unit of population (Greenbank 1963). However, white spruce weakened from repeated spruce budworm defoliation may become vulnerable to attack by bark beetles, such ad Dendroctonus piceaperda Hopk. and Ips perturbatus Eich. (Thomas)(Belyea and Prebble 1951). This possibility should be taken into consideration in presalvage and salvage management strategies in plantations being attacked by the spruce budworm.

RECOMMENDATIONS

Plantations with the greatest percentage of trees suffering from heavy defoliation should be thinned first. Plantations 1, 4, and 5 should be thinned from below because these stands exhibit a heavily damaged understory. Plantation 2 has already been thinned, and plantation 6 is too young to thin.

Intermediate trees in plantation 3 may die because of severe defoliation. Pesticides registered for spruce budworm suppression are carbaryl, acephate, trichlorfon, malathion, naled, and Bacillus thuringiensis. The latter, a biological pesticide, would be a likely candiate for use in this area due to environmental constraints.

DISCLAIMER STATEMENT

The use of trade, firm, or corporation names is for the information and convenience of the reader. Such use does not constitute an official evaluation, conclusion, recommendation, endorsement, or approval of any product or service to the exclusion of others which may be suitable.

Table 1.--Description of spruce plantations on the Eagle River Ranger District, Nicolet National Forest, 1978

Plantation	Area (acres)	Age (yr)	Mean tree height (ft)	Mean dbh (in.)	Basal area (acre)	Host trees/ acre	Associated species
1	7	30	48	8	90	460	Red pine Aspen
2	14	41	52	7	88	494	Red pine
3	72	45	43	7	83	635	Red pine Balsam fir
4	239	18-45 ($\bar{x}$=35)	54	6	83	400	Balsam fir Birch Aspen
5	30	33	44	6	60	513	Aspen
6	not measured	12	12	1	too small to measure	1,460	Hemlock
7	not measured	33	39	6	20	60	Red pine Aspen White ash Birch Maple

Table 2.--Percentage of spruce budworm defoliation in spruce plantations on the Eagle River Ranger District, Nicolet National Forest, 1978

Plantation number	Defoliation range (%)	Defoliation average (%)
1	35-99	71
2	20-95	54
3	20-99	77
4	20-99	47
5	5-75	24
6	5-90	43
7	5-55	19

Table 3.--Egg-mass data and predicted 1979 defoliation for seven spruce plantations on the Eagle River Ranger District, Nicolet National Forest

Plantation	Egg masses per 18-in. branch (number)	Parasitized egg masses (%)	Predicted 1979 defoliation[a/]
1	0.67	0	light
2	2.28	5	heavy
3	1.00	0	moderate
4	2.00	6	heavy
5	1.92	13	heavy
6	1.98	5	heavy
7	2.44	2	heavy

[a/] Light, 0-20 percent; moderate, 21-50 percent; heavy, 51-80 percent; severe, 81-100 percent.

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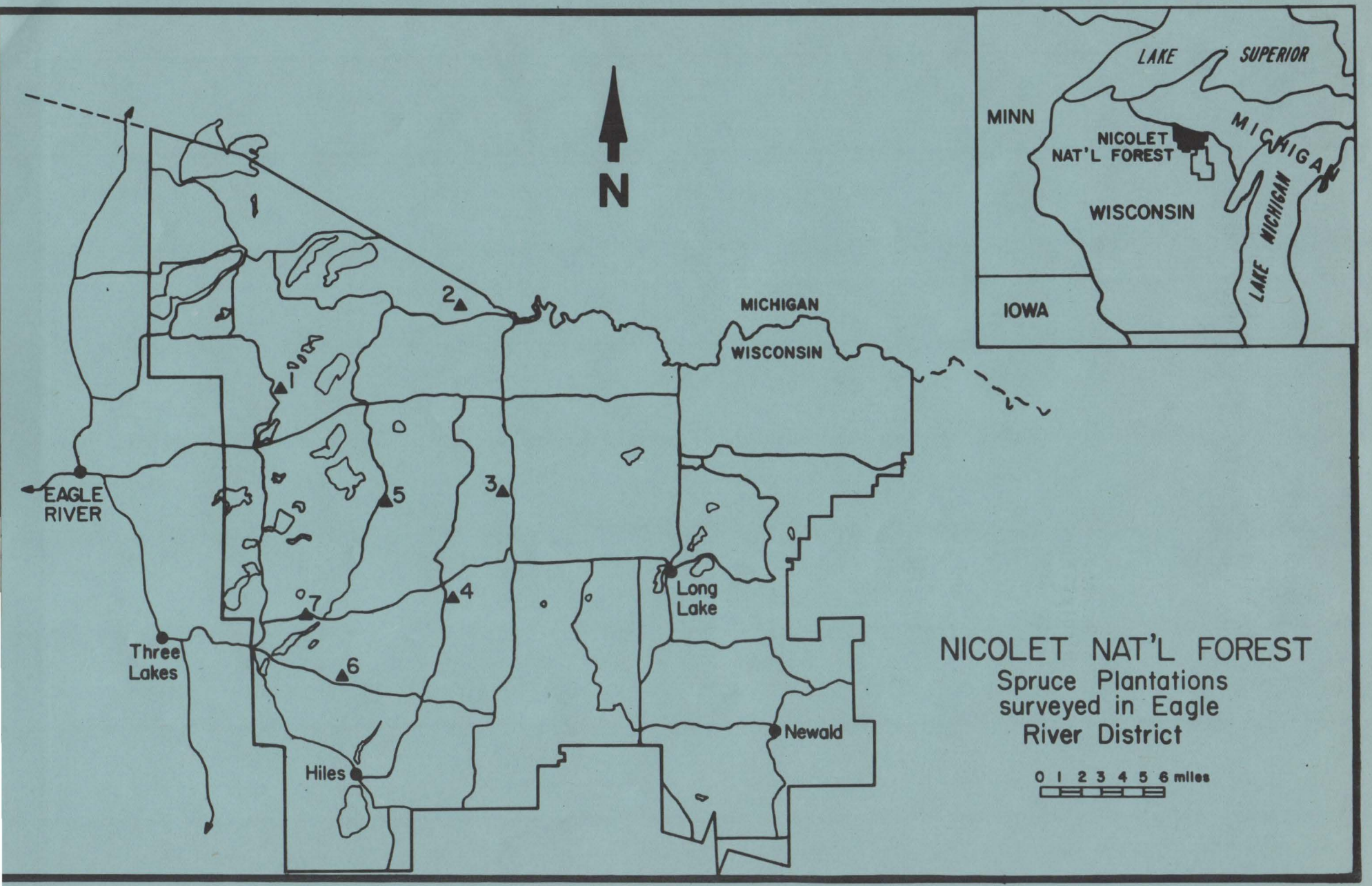
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LAKE SUPERIOR
MINN
NICOLET NAT'L FOREST
MICHIGA
WISCONSIN
LAKE MICHIGAN
IOWA
MICHIGAN
WISCONSIN
1
2
3
4
5
6
7
EAGLE RIVER
Three Lakes
Hiles
Long Lake
Newald
NICOLET NAT'L FOREST
Spruce Plantations surveyed in Eagle River District
0 1 2 3 4 5 6 miles